

**Prerequisites:** CHEM 163, CHEM 163L or CHEM 177, CHEM 177L or CHEM; credit or enrollment in CHEM 231L.

**Instructor:** Dustin Youmans (dyoumans@iastate.edu)

**Office Hours:** Wed and Fri 2:00-3:00 pm (location will be updated on canvas)

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**Head TA:** Dash Wallace (dashw@iastate.edu)

**Office Hours:** Tue 10:00-11:00 am (location will be updated on canvas)

**Course Delivery:** The course will be delivered in person in through a series of lectures. We will use Canvas as the official electronic interface for assignments such as homework and potential extra credit assignments. Please log in often for important announcements, extra posted lecture materials, previous exams, and grade information.

**Course Format:** For purposes of formatting, learning objectives, and Canvas Modules, we will follow the structure of chapters 1–14, and 16–18 in the *Introduction to Organic Chemistry*, 6th Edition, by Brown and Poon. The book is part of the *Immediate Access Program* at ISU. Each Course Content Module will contain material related to the learning objectives in that chapter, including assigned reading, old lecture videos and the homework. All assignments for this course are open-note and open-book except exams. Students are encouraged to collaborate on homework and all studying activities but are required to work alone on the Midterms and the Final Exam. An accompanying optional *Student Study Guide & Solutions Manual* of the *Introduction to Organic Chemistry*, 6th Edition, by Lee is also available and recommended. You are encouraged to utilize a molecular model kit to help with clarity in 3-dimensional visualizations.

**Required Technology:** The requirements for this course are a reliable internet connection, access to Iowa State University (ISU) computer system and Canvas, access to a computer with a microphone and audio capability, and access to WileyPLUS online testing platform via ISU's Immediate Access Program.

### *Assessments*

**Online Assignments:** Canvas-integrated WileyPLUS is our primary online assignment platform. The two homework assignments with the lowest scores will be dropped.

**Top Hat:** We will be using the Top Hat program during lectures as a means of practice, but the results on questions will not have an impact on your grade. It is expected that you answer the questions. The Top Hat program can be accessed through canvas and may be used on your phone or laptop to answer questions during the lecture.

**Exams:** There are *four* 100 pt midterm exams scheduled on *9/23, 10/18, 11/04 and 11/20* and a 150 pt final **exam**. Those who have class schedule conflicts or are representing the university in various activities must contact the instructor at least 5 days before the actual exam date and present valid documentation. All exams including the final will be **curved based on a class average of 70% unless the class average is higher** (e.g., all students who have taken a particular exam will get 15% added to the earned score if the class average is 55%). **The lowest score on a 100-point exam or a missed hour exam will be dropped.** (see schedule on pg. 3 for more information).

**Missed Exam:** Excused absences ought to be supported by valid documentation. ISU's Thielen Student Health Center does not provide documentation for excuses to miss exams. Pre-booked family vacation flights do not count either. Students who

miss two exams will be asked to drop the course. At the discretion of the instructor, and in exceptional cases, a grade considering proportionally higher weighting of the final exam may be assigned in lieu of a missed exam.

**Grades:** The grades will be assigned based on 50% midterm exams, 25% final exam, and 25% online homework. At the discretion of the instructor extra credit assignments may be implemented for up to 3%. The instructor may curve the grades by taking into consideration the exam difficulty and overall class performance. However, the following cut-offs are guaranteed: Grade (% Score): A( $\geq 91$ ); A-( $\geq 86$ ); B+( $\geq 83$ ); B( $\geq 80$ ); B-( $\geq 75$ ); C+( $\geq 71$ ); C( $\geq 66$ ); C-( $\geq 61$ ); D( $\geq 50$ ); and F( $< 50$ ).

### *Course Policies*

**Missed and Late Coursework:** It is important to keep up with the pace of this course, therefore no late course work will be accepted. Rare extensions may be granted under extenuating circumstances, entirely at the discretion of the instructor. Coursework extensions are more likely to be granted if you approach the instructor in advance by presenting reasonably acceptable documentation.

**Free Expression:** Free Expression Iowa State University supports and upholds the First Amendment protection of freedom of speech and the principle of academic freedom in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner. No employee, student, applicant, or campus visitor is compelled to disclose their pronouns. Anyone may voluntarily disclose their own pronouns.

**Academic Misconduct:** The student disciplinary regulations will be enforced for any form of academic misconduct. This includes but not limited to: Copying or sharing answers on tests/assignments/quizzes, altering graded exam papers and submitting for regrade, plagiarism, and bribery (offering someone else money or service to gain an academic advantage). Depending on the act, a student could receive a zero on the test/assignment, F grade for the course, and could be suspended or expelled from the University. See the Conduct Code for more details and a full explanation of the ISU Academic Misconduct policies. *Instances of suspected academic misconduct are to be reported to the Dean of Students' office.*

**Other Policies:** This course will adhere to university policies on accommodations, inclusiveness, academic integrity, and so on, as described in the Syllabus Statements.

### *Learning Objectives*

After taking Chem 2310 you should:

- have a good understanding of *molecular structure*. This includes *sigma* and *pi bonding*, *strain*, *aromaticity*, and *stereochemistry*. You should have a good grasp of the three-dimensional structure of molecules and that their interactions with each other (like enzymes or DNA) can and does depend on these structural relationships.
- be able to recognize reactive parts of molecules. In particular, you should be able to identify *nucleophilic* and *electrophilic* centers. You should be able to understand how to make certain centers more nucleophilic or electrophilic, e.g., by *deprotonating* or *protonating* them.
- be able to recognize types of reactions that you see in different contexts. For example, you should recognize *substitutions*, *additions*, *oxidations*, and *reductions*, no matter whether you see them in organic chemistry or in a metabolism class.
- have a good fundamental understanding of the common reactions that take place at several *functional groups* within organic molecules, such as *alcohols*, *carbonyls*, and *alkenes*.

- be able to *understand* and *interpret* complex *reaction mechanisms* if they are presented to you. You should be able to suggest reasonable reaction mechanisms for almost every reaction you know, based on the knowledge on the reactive parts of molecules and reactive intermediates. You should be able to make a good guess about the mechanism of a new reaction presented to you. The level at which you can do this will be less sophisticated than if you took 331/332, but you should still be proficient at understanding organic reactions presented in other contexts, such as metabolism.
- have a reasonable repertoire of reactions that you can call upon to *synthesize* a molecule of modest complexity or follow its synthesis or biosynthesis as presented to you.
- be able to *apply basic principles* of small molecule organic chemistry to useful/common macromolecules like polymers/oligomers such as sugars, proteins, nucleic acids, and “traditional” organic polymers like polystyrene or PVC.

### Course Schedule

1	M 8/26	Chap. 1 Bonding	9	W 10/21	Chap. 8 Alcohols and Ethers
	W 8/28	Chap. 1 Structures		W 10/23	Chap. 8 Alcohols and Ethers
	F 8/30	Chap. 1 Hybridization		F 10/25	Chap. 9 Aromatic Compounds
2	M 9/02	Chap. 1 Functional Groups	10	M 10/28	Chap. 9 Aromatic Compounds
	W 9/04	Chap 11.1–11.4 IR		W 10/30	Chap. 10 Amines
	F 9/06	Chap 11.1–11.4 IR		F 11/01	Review
3	M 9/09	Labor Day (no class)	11	M 11/04	<b>Exam 3 (Chap. 8-10)</b>
	W 9/11	Chap. 2 Acids and Bases		W 11/06	Chap. 11.5–11.12 NMR
	F 9/13	Chap. 2 Acids and Bases		F 11/08	Chap. 11.5–11.12 NMR
4	M 9/16	Chap. 3 Alkanes and Cycloalkanes	12	M 11/11	Chap. 12 Aldehydes and Ketones
	W 9/18	Chap. 3 Alkanes and Cycloalkanes		W 11/13	Chap. 12 Aldehydes and Ketones
	F 9/20	Chap. 4 Alkenes/Alkynes		F 11/15	Chap. 13 Carboxylic acids
5	F 9/23	<b>Exam 1 (Chap. 1-4)</b>	13	M 11/18	Review
	M 9/25	Chap. 4/5 Alkenes/Alkynes (Reactions)		W 11/20	<b>Exam 4 (Chap. 11b, 12,13)</b>
	W 9/27	Chap. 5 Alkenes/Alkynes (Reactions)		F 11/22	Chap. 14 Carboxylic acid derivatives
6	M 9/30	Chap. 5 Alkenes/Alkynes (Reactions)	14	M 11/25	Thanksgiving Break (no class)
	W 10/02	Review		W 11/27	Thanksgiving Break (no class)
	F 10/04	Review		F 11/29	Thanksgiving Break (no class)
7	M 10/07	Chap. 6 Chirality	15	M 12/02	Chap. 14 Carboxylic acid derivatives
	W 10/09	Chap. 6 Chirality		W 12/04	Chap. 16 Organic Polymers
	F 10/11	Chap. 7 SN/E Reactions for RX		F 12/06	Chap. 17 Carbohydrates
8	M 10/14	Chap. 7 SN/E Reactions for RX	16	M 12/09	Chap. 18 Amino acids and proteins
	W 10/16	Review		W 12/11	Review
	F 10/18	<b>EXAM (Chap. 5-7)</b>		F 12/13	Review